REMARKS

The subject invention relates to the measurement of overlay registration of layers created in semiconductors during the lithography process. Historically, overlay registration was measured using an optical microscope focusing on the alignment of optical targets (e.g. box in box). As geometries have shrunk, certain techniques based on diffraction measurements have been investigated. In these techniques, the targets consist of a pair of gratings, one grating formed in the lower layer and another grating formed on the upper layer. By monitoring light diffracted from the targets, the amount of misregistration between the layers can be determined.

One complication with using gratings is that the diffraction signal is periodic with increasing misregistration. Thus, diffraction methods cannot distinguish overlay errors that differ by an integer number of periods. Accordingly, errors can arise if the overlay misregistration is based solely on a diffraction measurement since it cannot preclude the possibility that a much larger, gross overlay error exists.

The subject invention overcomes this problem using a specially configured overlay target from which both the gross and fine overlay can be determined. The subject application discloses a few types of overlay targets which would be useful in the subject invention. For example, Figure 5 discloses a target consisting of a pair of overlying gratings. Grating pair 110X is arranged so that the overall dimension in the Y direction for one of the two gratings is larger than the Y dimension of the other grating. As can be seen, this means there are two regions (Y_1 and Y_2) where the gratings do not overlap. The size difference between the two gratings is selected to be sufficient so that each region (Y_1 and Y_2) can be measured using an optical microscope. This measurement can be used to determine the gross overlay. Fine overlay is determined using a diffraction measurement of the target. In accordance with the method of the subject invention, the gross and fine overlay measurements are combined to determine a total overlay measurement.

Turning to the Office Action, claims 1 to 6 and 13 to 22 were rejected under 35 USC 101. The Examiner argued that these claims were not statutory because they did not produce a tangible result. Applicants believe that the Examiner has misapplied the Interim Guidelines. In particular, the approach described in the Guidelines is directed to claims which essentially cover a computer related algorithm, in other words, claims that are essentially abstract in nature. In such a case, the Guidelines teach that the otherwise "abstract" claim may be still be statutory if it

leads to a tangible result. In contrast, a method claim (such as claim 1) covering the measurement of a **real world object** (e.g. a semiconductor wafer) is not "abstract." This type of claim is not a "judicial exception" **and has heretofore always has been considered statutory subject matter**. However, to expedite prosecution, applicants have amended the claims to include the extra step of controlling the lithography process which is clearly a tangible result. Support for this amendment can be found on page 1, line 27+. Claims 1, 13 and 22 have also been amended to make it clear that the detection of both the gross and fine overlay is obtained from a measurement of the metrology target. In view of the above, it is respectfully submitted that claims 1 to 6 and 13 to 22 are in condition for allowance.

In the Office Action, the Examiner rejected claims 7 to 10 and 12 as being obvious based on the commonly owned publication of Sezginer (W0/ 02/065545). It appears that in the rejection, the Examiner is relying on the very slight overall dimensional differences between the upper and lower gratings illustrated in Sezginer. However, these differences are on the order of the linewidth of the grating such that these differences could not be used to measure gross overlay with a microscope and therefore it is not surprising that, as the Examiner notes, Sezginer is silent on whether these difference are sufficient to measure gross overlay.

In order to further distinguish the subject invention from Sezginer, applicants have amended claim 7 to recite that the minimum overall size difference between the gratings is at least two periods (a period on a line grating would be one line plus one space). Support for this amendment is based on the drawings which show a difference of about four periods in each of the examples, but in reality, would likely be larger. It should also be noted that the passage in Sezginer cited by the Examiner states that the uncertainty can be removed by measuring a **separate** bar in bar pattern (page 29, line 9). There is no disclosure in Sezginer relating to a specially configured overlay metrology target which can be used to measure **both** gross and fine overlay.

Based on the above, it is respectfully submitted that amended, independent claim 7 defines patentable subject matter and allowance, thereof, along with the claims depending therefrom is respectfully solicited.

Respectfully submitted,

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